

real use to the student. We are told that a milligram of hydrogen contains about 400,000,000,000,000 atoms of hydrogen, and a milligram of gold 2,000,000,000,000 atoms, while the atomic weight of gold is given as 196; if this is admitted, the milligram of gold will contain some 40816,000,000,000 atoms in excess of the number given above, and the omission of this will in itself show the extreme generality of such statements. A curious deduction as to the *form* of atoms is drawn from the fact that many minerals are observed, when reduced to powder, to preserve their normal crystalline form; hence, says our author, "we conclude the compound atom possesses form closely related to the cleavage form."

The law of Dulong and Petit is very concisely stated, and its importance in modern chemistry is well illustrated. It is crudely formulated thus:—if  $a$  represents the atomic weight and  $s$  the specific heat, the product  $as$  will be the specific heat  $S$  of a gram-atom of the substance, and  $S = as$  nearly equal to 6.3.

Or again, if the specific heat  $S$  of an element be known, an approximate determination of the atomic weight can be found as follows:—

$$a = \text{nearly } \frac{6.3}{s}$$

Thus the specific heat of lead = 0.031, consequently  $\frac{6.3}{0.031} = 200$ , the exact atomic weight of lead being 207.

The service afforded by the application of this law to the determination of the *right* atomic weight of an element is also shown in this case of lead, for from the analysis of oxide of lead the atomic weight of lead might be 207, or 103.5, or 69, or 414, or 621, for although we find that sixteen parts by weight of oxygen are united with 207 of lead, we have no direct chemical proof that the 207 represents one atom; but the law of Dulong and Petit now steps in and shows us that the right atomic weight is 207, because it alone satisfies the conditions of that law. And so for other elements the vapour density of whose compounds cannot be determined. The section on Atomicity or valence would be much improved by the introduction of a complete list of the elements with their atomicities, and a discussion of doubtful atomicities.

In the seventh section the author passes at once from what were once called inorganic compounds to the discussion of organic substitutions as shown in the great methyl series of compounds. Such comprehensive statements as, "the binary marsh gas, also called *methane*,  $\text{CH}_4$ , is the basis of all organic compounds," are of great use to the student, and in this instance the statement at once justifies the passage from mineral chemistry to so-called organic chemistry without one word of introduction or comment. We do not think that the attempted graphical representation of chemical constitution in the eighth section can be productive of anything but confusion to the student. The crosses and dots and three-limbed signs have themselves to be remembered, and cannot give any precise idea of the constitution of a complex compound. A somewhat detailed account of the constitution and syntheses of various serial compounds concludes that portion of the work devoted to Molecular Statics.

The second part commences with an account of the motions of molecules, and it is asserted that since molecules are not spherical, their impact against each other

will not alone produce motion of translation, but also motion of rotation, and this is partially illustrated by the motion of a boomerang. The following definitions are stated on the authority of the author:—

1. "The molecules of a body in the gaseous condition have a motion of translation, and also a motion of rotation around their natural axis of maximum moment of inertia."

2. "The molecules of a body when in the solid state have only a vibratory motion about a position of equilibrium."

3. "The molecules of a body when in the liquid state have a vibratory motion, as in the solid state, and also a motion of rotation around their natural axis of minimum moment of inertia."

Among the concluding sections of the book is a very interesting and suggestive account of *calorization*, that is the amount of heat produced or absorbed in any chemical process. The treatment (p. 153), from a calorization point of view, of the reactions of hydrogen, chlorine, iodine, and silver, is worthy of careful study. A few pages at the end of the book treat of Systematic Chemistry and Applied Chemistry.

Dr. Hinrich's book must be used in connection with his former works, "Elements of Chemistry" and "Elements of Physics," to which frequent references are made. It is mainly intended as a guide to the student, and must be used with the assistance of a teacher. To the advanced student it will be found to be of great use, and most eminently suggestive; but it will be almost useless to any reader who has not before acquired the main principles of chemical science, together with a large storehouse of chemical facts. The work is somewhat disfigured by numerous misprints—*dissociation* (p. 21), *amides* (p. 73), *redaction* (p. 109), *energy* (p. 113), &c., and we think the two plates at the end are extremely confusing; but these minor matters are easily remedied in a second edition, and need not detract greatly from the value of a really useful and comprehensive work.

G. F. RODWELL

#### THE ZOOLOGY OF THE "EREBUS" AND "TERROR."

*The Zoology of the Voyage of H.M.S. "Erebus" and "Terror," under the command of Captain Sir James Clark Ross, R.N., F.R.S., during the years 1839 to 1843.* By authority of the Lords Commissioners of the Admiralty. Edited by John Richardson, M.D., F.R.S., &c., and John Edward Gray, Esq., Ph.D., F.R.S., &c.

No. XIX.—*Insects* (conclusion). By Arthur Gardiner Butler, F.L.S., F.Z.S., &c. 1874.

No. XX.—*Crustacea*. By Edward J. Miers. 1874.

No. XXI.—*Mollusca*. By Edgar A. Smith, F.Z.S., &c.

No. XXII.—*Birds* (conclusion). By R. Bowdler Sharpe, F.L.S., F.Z.S., &c. 1875.

No. XXIII.—*Mammalia* (conclusion). By John Edward Gray, Ph.D., F.R.S., F.L.S., &c. 1875.

No. XXIV.—*Reptiles* (conclusion). By Albert Günther, M.A., M.D., Ph.D., F.R.S., V.P.Z.S. 1875.

THE non-completion of the "Zoology of the Voyage of the *Erebus* and *Terror*" has long been a public scandal. The celebrated voyage of these ships,

commonly known as the "Antarctic Expedition," took place in 1839, and the four following years. Dr. Hooker, under the title of "Assistant Surgeon" to the *Erebus*, was the Naturalist of the Expedition, and assisted by Messrs. M'Cormack and Robertson, the medical officers of the vessels, made an extensive collection of specimens in every department of zoology and botany. The botanical specimens were sent to Kew; the zoological to the British Museum. Dr. Hooker undertook the working out and publication of the former, and Dr. Gray of the latter. At the recommendation of the Admiralty the Government granted the sum of 2,000*l.* for the illustration of the work, half of which was assigned to the botanical and half to the zoological portion. Dr. Hooker's labours resulted in the two large quarto volumes which form the well-known "Botany of the Antarctic Expedition," and remain to the present day the standard authority upon the plants of the southern hemisphere. Very different were the results achieved by the thousand pounds bestowed upon the zoological portion of the work. After the publication of eighteen numbers, the various sections assigned to the different naturalists were left, one and all, incomplete, and have thus remained until the present day. Whether this untoward result was occasioned by the fault of the editor or of the publisher, or by misunderstandings between the two, has never been divulged to the public, nor does it now much concern us to inquire. Whichever may have been the case, the result was equally discreditable to the parties concerned. It is with pleasure, however, we see that the scandal exists no longer. An enterprising publisher has bought up the "remainder" of the plates of the unfinished work, and made arrangements for its completion. Whether it was justifiable on the part of the vendor to sell what had been produced by public money may be open to some doubt, but the purchaser, Mr. Janssen, is at all events entitled to the credit of having done all he could to bring this long neglected work to a satisfactory conclusion. The six numbers of the "Zoology of the *Erebus* and *Terror*" now before us, conclude the different sections, and enable the subscribers after twenty years of patient expectation to send their copies to the binders. On turning over the pages of the lately issued numbers, we find many admirably executed plates among them, and much valuable contribution to Zoological science. Dr. Günther's synopsis of the Australian Lizards is of special interest, and will, we are sure, prove most acceptable to the working naturalists of the Australian Colonies. As regards some of the illustrations of the birds, we may remark that the colouring is not very well executed—notice especially the figures of the King and Emperor Penguins. This is the more the pity, as the figures themselves are the productions of Mr. Wolf's artistic pencil.

#### OUR BOOK SHELF

*Flora of Eastbourne.* Being an Introduction to the Flowering Plants, Ferns, &c., of the Cuckmere District, East Sussex, with a Map, by F. C. S. Roper, F.L.S., &c., President of the Eastbourne Natural History Society. 8vo, pp. 165. (London, Van Voorst.)

THIS is an admirable little book of its kind, the greatest care and conscientiousness having evidently been exercised

in its compilation. The plan adopted by the author was to include only such species as he had actually gathered himself, or of which he had seen authentic specimens, hence a considerable number of species which we know, from personal observation, to grow within the limits of the Cuckmere district are omitted, or only given in an appendix. However, Mr. Roper will doubtless soon publish a supplement, and the basis upon which he has started is far preferable to the indiscriminate admission of everything from sources of uncertain value. Another cause for the absence of certain species is the quite recent extension of the field of operations to coincide with the Cuckmere drainage district of Mr. Hemsley's projected flora of the whole county. This forms an irregular triangle, having its apex on the ridge of the weald at Cross-in-hand, and its base running along the coast from the Signal House, east of Seaford, to St. Leonards. Its area is about 150 square miles, and it comprises a great variety of soils and situations, but there is very little boggy land, consequently a paucity of bog plants. Mr. Roper's list numbers 700 species, which further explorations will probably augment by about one hundred. It is surprising that such plants as *Papaver dubium*, *Arenaria trinervis*, *Rubus discolor*, *Campanula rotundifolia*, *Ophrys muscifera*, *Funcus maritimus*, *Aira flexuosa*, *Bromus giganteus*, &c., should have escaped observation; but such is the case, and they are not included in the *Flora*. Among the more interesting plants of this part of Sussex, and not found elsewhere in the county, we may mention *Phyteuma spicatum*, *Pyrola minor*, *Bupleurum aristatum*, *Seseli Libanotis*, *Sibthorpia europæa*, and *Bartsia viscosa*. The *Pyrola* was recently discovered in Sussex for the first time by Mr. Roper, so the botanist should never despair of finding something new. The *Flora of Eastbourne* has appeared just at the right time for visitors to Eastbourne this season, who will find it a valuable guide, and all the more welcome, perhaps, because there is a chance of adding to the number of species it includes. We should add that, like most local floras of recent publication, it simply treats of the distribution of the plants, but the book before us differs from most others in its copious references to other works, which will be useful to amateurs who may have occasion to consult descriptions or plates.

We may here mention that we have received a circular from the Lewes and East Sussex Natural History Society respecting a projected Fauna and Flora of East Sussex, which will be forwarded to any person interested in the work on application to the Secretary, Mr. J. H. A. Jenner, Lewes.

*Repertorium der Naturwissenschaften.* Monatliche Uebersicht der neuesten Arbeiten auf dem Gebiete der Naturwissenschaften. Herausgegeben von der Redaktion des *Naturforscher*. (January to June 1875, Nos. 1 to 6, Berlin.)

THIS is a useful supplementary publication to *Der Naturforscher*. It consists of sixteen columns (the columns are numbered and not the pages) in quarto form. The number for May is made up of twenty-four columns, and gives the titles of more than 600 papers, which are published in upwards of eighty separate works. The periodicals thus indexed are the *Monatsberichte* (Berlin), *Comptes Rendus* (Paris), *Botanische Zeitung* (Leipzig), *Flora* (Regensburg), *Hedwigia* (Dresden), *Proceedings of the Royal Society* (London), *American Journal of Sciences and Arts* (New Haven), *Geographical Magazine* (London), *Messenger of Mathematics*, *Astronomische Nachrichten* (Kiel), &c. Though there are several publications we miss, both English and foreign, it will be seen that a good beginning is here made, and that there is a prospect in time of students being fairly informed of what is being done in science in this country and elsewhere in a compact publication issued at a reasonable rate.